

REMARKS

In this Amendment, Applicants amend claim 12 to more appropriately claim the invention and to advance prosecution of the present application. In accordance with the requirements of 37 C.F.R. § 1.121(c)(1), Applicants provide a marked-up version of the amended claim in an attached Appendix designated "Version of Claim with Markings to Show Changes Made."

Claims 1 – 20 remain pending, with claims 1 – 11, 19, and 20 withdrawn from consideration as drawn to a nonelected invention. In the Final Office Action, the Examiner rejected claims 12 – 16 under 35 U.S.C. § 112, 2nd paragraph, as being indefinite; rejected claims 12 – 16 under 35 U.S.C. § 103(a) as unpatentable over Hu, et al. (U.S. Patent No. 5,962,904) and Wittmer, et al., Oxidation Kinetics of TiN Thin Films, J. Appl. Phys. 52(11), pp. 6659 – 6664 (1981), and further in view of Nakajima, et al. (U.S. Patent No. 5,907,188); and allowed claims 17 and 18. Applicants acknowledge with appreciation the Examiner's indication that claims 17 and 18 are drawn to allowable subject matter.

Applicants appreciate the Examiner's thorough examination of this application, especially the detailed citations which aided Applicants in reviewing the Examiner's comments. Applicants respectfully traverse the rejections, as detailed above, for the following reasons.

Rejection of Claims 12 – 16 under 35 U.S.C. § 112, 2nd ¶:

Regarding the rejection of claims 12 – 16 under 35 U.S.C. § 112, 2nd paragraph, Applicants have amended claim 12 to more clearly define the present invention and to address the Examiner's concerns. Applicants therefore respectfully deem the rejection of claims 12 – 16 overcome. Claims 12 – 16 fully comply with the requirements of 35 U.S.C. § 112, 2nd paragraph, and Applicants accordingly request withdrawal of that rejection.

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Rejection of Claims 12 – 16 under 35 U.S.C. § 103(a):

Applicants respectfully traverse the rejection of claims 12 – 16, as detailed above, for the following reasons.

Regarding the 35 U.S.C. § 103(a) rejection of claims 12 – 16, Applicants disagree with the Examiner's arguments and conclusions. "To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. ... If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious." See M.P.E.P. § 2143.03, 8th Ed., Aug. 2001, p. 2100-26. Furthermore, regarding dependent claims 13 – 16, "Examiners are reminded that a dependent claim is directed to a combination including everything recited in the base claim and what is recited in the dependent claim. It is this combination that must be compared with the prior art, exactly as if it were presented as one independent claim." M.P.E.P. § 608.01(n)(III), p. 600-77. The Examiner does not show that all the elements of Applicants' claims are met in the cited references, taken alone or in combination, and does not show that there is any suggestion or motivation to modify the cited references to result in the claimed invention.

Applicants' claim 12 recites a combination of elements, including, *inter alia*, a "metal- containing insulating film including a plurality of first insulating regions each of which is formed of a grain containing a metal oxide and a second insulating region, said second insulating region formed of an amorphous insulating material." |

Hu and/or Wittmer do not teach or suggest at least these recitations of Applicants' claim 12. In contrast, Hu discloses a 9 nm gate oxide layer 14, poly-Si layer 16, electrically conductive Si material (preferably refractory metal Si-nitride and also amorphous (Hu, col. 5, ll. 59-60)) as a diffusion barrier 18, a W / W_xSi_y electrode layer 20, and a cap 34. While the Examiner admits that "Hu and Wittmer do not specifically describe the limitation[, "i]ncluding a plurality of first

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insulating regions each of which is formed of a grain containing a metal oxide[']" (Final Office Action, p. 3), the combination with Nakajima still does not teach or suggest at the least the recitations of Applicants' claim 12 as discussed above. Hu, Wittmer, and Nakajima, taken alone or in combination, clearly do not disclose the recitations of Applicants' claim 12 quoted above. In part, this is because Hu's only insulating film is gate oxide layer 14 (Figure 4), while Hu's remaining film layers are either semiconducting (poly-Si layer 16) or electrically conductive (diffusion barrier 18 and W / W_xSi_y electrode layer 20). Hu clearly does not teach or suggest a plurality of first insulating regions.

Furthermore, Applicants respectfully submit that the Examiner has incorrectly paraphrased Applicants' claim 12 when he applied the Nakajima reference. The Examiner alleges that "the Nakajima reference ... in figs. 31 A -I and col. 31 lines 3 to col. 32 line 50 describes a CMOSFET having a plurality of first insulating regions each of which is formed of a grain containing a metal oxide to from [sic] the CMOS device" (Final Office Action, p. 3). Applicants submit that the Examiner did not address the remaining portion of the same recitation in Applicants' claim 12. This recitation properly states, "a plurality of first insulating regions each of which is formed of a grain *containing a metal oxide and a second insulating region*, said second insulating region formed of an amorphous insulating material" (italics added). Nowhere in Nakajima—let alone in col. 31 lines 3 to col. 32 line 50 (as alleged by the Examiner)—is there any teaching or suggestion of "insulating regions each of which is formed of a grain containing a metal oxide and a second insulating region, said second insulating region formed of an amorphous insulating material," as in Applicants' claim 12. Nakajima merely discloses insulating layers formed during device fabrication processes (none of which are labeled "first insulating regions"), and discloses nothing regarding the contents of grains in an insulating region as claimed by Applicants.

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Even though Nakajima does not teach or suggest all the features of Applicants' claimed invention, the Examiner's application of Nakajima as a reference, in addition to Hu and/or Wittmer, does not render the recitations of Applicants' claims obvious. Even considering the Examiner's incorrect construal of Applicants' present claimed invention, this still does not establish that there would have been the requisite suggestion or motivation in Nakajima to modify the reference to teach or suggest Applicants' claimed invention. Applicants respectfully point out to the Examiner that it "is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art." See In re Wesslau, 147 U.S.P.Q. 391 (C.C.P.A. 1965). See also M.P.E.P. § 2141.02, p. 2100-120.

While the Examiner alleges "it would have been obvious to one of ordinary skill in the art at the time of the invention to include Nakajima's plurality of first insulating regions each of which is formed of a grain containing a metal oxide in Hu and Wittmer's device to form a CMOS device" (Final Office Action, p. 3), Wittmer and/or Nakajima, taken alone or in combination, still do not cure the deficiencies of Hu. Wittmer's "investigat[ion of] the oxidation kinetics of TiN thin films dry O₂ in view of possible application of TiN as the material for gate electrodes" (Wittmer, Abstract) still does not teach or suggest the recitations of Applicants' invention not taught or suggested by Hu. Since Hu, Wittmer, and Nakajima, taken alone or in combination, do not teach or suggest at least the elements of Applicants' claim 12, the Examiner's application of Hu, Wittmer, and Nakajima as references to formulate an obviousness rejection under 35 U.S.C. § 103(a) is improper.

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The Examiner has therefore not met at least one of the essential criteria for establishing a *prima facie* case of obviousness, wherein "the prior art reference (or references when combined) must teach or suggest all the claim limitations." See M.P.E.P. §§ 2142, 2143, and 2143.03.

Furthermore, there is no suggestion or motivation to modify Hu with Wittmer and/or Nakajima to produce Applicants' claimed invention. Even the Examiner's characterization of the references still does not establish that there would have been the requisite suggestion or motivation to modify Hu with Wittmer and/or Nakajima. "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." M.P.E.P. § 2143.01, p. 2100-124, citing *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Because Hu, Wittmer, and Nakajima *cannot* be modified to produce Applicants' invention, their resultant combination cannot be obvious, since, for the reasons presented above, it does not produce Applicants' claimed invention. Likewise, there cannot be any expectation of success from so doing, because combining the references still would not produce Applicants' claimed invention.

In addition, the M.P.E.P. states "[a] statement [by the Examiner] that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the invention was made"" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references." M.P.E.P. § 2143.01, p. 2100-124 (citations omitted, emphasis in original). Because Applicants have already established that Hu, Wittmer, and Nakajima cannot be modified to produce the present invention, Applicants submit that, according to the M.P.E.P., the Examiner's citation of Hu, Wittmer, and Nakajima is not sufficient to establish *prima facie* obviousness over Applicant's claims 12 - 16.

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Applicants also contest the Examiner's allegation that "[i]t would have been obvious to one of ordinary skill in the art ... to include Nakajima's plurality of first insulating regions ... in Hu and Wittmer's device[s] to form a CMOS device." (Final Office Action, p. 3), as Applicants have already demonstrated herein that the cited references do not teach or suggest each and every element of Applicants' independent claim 12. The Examiner's statement is an unsubstantiated generalization of questionable relevance to claim 12. Applicants refer the Examiner to the February 21, 2002 Memorandum from USPTO Deputy Commissioner for Patent Examination Policy, Stephen G. Kunin, regarding "Procedures for Relying on Facts Which are Not of Record as Common Knowledge or for Taking Official Notice." In relevant part, the Memorandum states, "If the examiner is relying on personal knowledge to support the finding of what is known in the art, the examiner must provide an affidavit or declaration setting forth specific factual statements and explanation to support the finding" (Memorandum, p. 3). Applicants submit that the Examiner made a generalized statement regarding Applicants' claim 12 without any documentary evidence to support it. Applicants traverse the Examiner's presumed taking of "Official Notice," noting the impropriety of this action, as the Federal Circuit has "criticized the USPTO's reliance on 'basic knowledge' or 'common sense' to support an obviousness rejection, where there was no evidentiary support in the record for such a finding." *Id.* at 1. Applicants submit that "[d]eficiencies of the cited references cannot be remedied by the Board's general conclusions about what is 'basic knowledge' or 'common sense.'"*In re Lee*, 61 USPQ2d 1430, 1432-1433 (Fed. Cir. 2002), quoting *In re Zurko*, 59 USPQ2d 1693, 1697 (Fed. Cir. 2001).

Should the Examiner maintain the rejection after considering the arguments presented herein, Applicants submit that the Examiner must provide "the explicit basis on which the examiner regards the matter as subject to official notice and [allow Applicants] to challenge the assertion

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in the next reply after the Office action in which the common knowledge statement was made” (Id. at 3, emphasis in original), or else withdraw the rejection.

Finally, Applicants note that the Examiner quoted “[t]he other added limitation” (Final Office Action, p. 4), presumably to characterize Applicants’ claim 12. This quote, however, while paraphrasing a recitation of Applicants’ claim 12, does not match recitations of Applicants’ claims, and furthermore, the Examiner’s citation of Hu col. 5, l. 55, for the quotation is incorrect. Neither Hu nor Applicants’ disclosure match the Examiner’s quotation. Since p. 4, paragraph 1 of the Final Office Action is not a complete sentence, and does not present any arguments regarding the cited references, Applicants deem this portion of the Final Office Action moot, since it is impossible to respond to an incorrect quotation and an incorrect citation.

Applicants have demonstrated herein that the Examiner: (a) has not shown all recitations of Applicants’ claimed invention are taught or suggested by Hu, Wittmer, and Nakajima; (b) has not shown any requisite motivation to modify Hu, with Wittmer and/or Nakajima to produce Applicants’ claimed invention; and (c) has not shown there would be any reasonable expectation of success from modifying Hu, Wittmer, and Nakajima in order to produce the present claimed invention.

Conclusion:

In view of the foregoing, Applicants submit that the rejection of claims 12 – 16, detailed in the sections above, is improper and should be withdrawn. Applicants submit that pending claims 12 – 18 are in condition for allowance. A favorable action is requested.

Should the Examiner continue to dispute the patentability of the claims after consideration of this Amendment, Applicants invite the Examiner to contact Applicants’ representatives by telephone to discuss any remaining issues.

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Please grant any extensions of time under 37 C.F.R. § 1.136 required in entering this response. If there are any fees due under 37 C.F.R. § 1.16 or 1.17, which are not enclosed, including any fees required for an extension of time under 37 C.F.R. § 1.136, please charge such fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: August 21, 2002

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APPENDIX TO AMENDMENT OF AUGUST 21, 2002
"VERSION OF CLAIM WITH MARKINGS TO SHOW CHANGES MADE"

AMENDMENTS TO THE CLAIM:

Please amend claim 12 as follows:

12. (Twice Amended) A semiconductor device, comprising:

a semiconductor substrate;

a metal-containing insulating film formed directly or indirectly on said semiconductor substrate, said metal-containing insulating film including a plurality of first insulating regions each of which is formed of a grain containing a metal oxide and a second insulating region, said second insulating region formed [between the first insulating regions and occupied by] of an amorphous insulating material; and

an electrode formed on said metal-containing insulating film.

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